

Aim: What are isotopes and how do we recognize them?

Isotope: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Isotopes can be written several ways:

Here are three isotopes of an element:  ${}^1_6\text{C}^{12}$        ${}^1_6\text{C}^{13}$        ${}^1_6\text{C}^{14}$

- The element is: \_\_\_\_\_
- The number 6 refers to the \_\_\_\_\_
- The numbers 12, 13, and 14 refer to the \_\_\_\_\_
- How many protons and neutrons are in the first isotope? \_\_\_\_\_
- How many protons and neutrons are in the second isotope? \_\_\_\_\_
- How many protons and neutrons are in the third isotope? \_\_\_\_\_

Isotopes can also be written like this:

Carbon-12 , Carbon-13 and Carbon-14. Their atomic mass is mentioned in each case.

In the Isotopic or Bohr notation the atomic mass is at the top and the atomic number is at the bottom. When identifying elements that are isotopes they need to have

\_\_\_\_\_  
\_\_\_\_\_

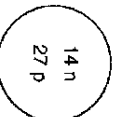
Complete the following chart:

Isotope name	atomic #	mass #	# of protons	# of neutrons	# of electrons
uranium-235					
uranium-238					
boron-10					
boron-11					

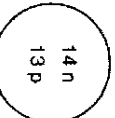
## Isotopic Notation

- Which notations represent different isotopes of the element sodium?
  - $^{32}\text{S}$  and  $^{34}\text{S}$
  - $\text{S}^{2-}$  and  $\text{S}^{4+}$
  - $\text{Na}^+$  and  $\text{Na}^0$
  - $^{22}\text{Na}$  and  $^{23}\text{Na}$
- The most common isotope of chromium has a mass number of 52. Which notation represents a different isotope of chromium?
  - $^{52}\text{dCr}$
  - $^{54}\text{Cr}$
  - $^{24}\text{Cr}$
  - $^{24}\text{dCr}$
- Chlorine-37 can be represented as
  - $^{17}\text{Cl}$
  - $^{20}\text{Cl}$
  - $^{35}\text{Cl}$
  - $^{37}\text{Cl}$
- Which isotopic notation represents an atom of carbon-14?
  - $^6\text{C}$
  - $^{12}\text{C}$
  - $^{14}\text{C}$
  - $^{16}\text{C}$
- Which diagram represents the nucleus of an atom of  $^{27}_{13}\text{Al}$ ?
 


A)




B)



C)




D)



- An atom of potassium-37 and an atom of potassium-42 differ in their total number of
  - electrons
  - neutrons
  - protons
  - positrons
- Which notation represents an atom of sodium with an atomic number of 11 and a mass number of 24?
  - $^{21}\text{Na}$
  - $^{24}\text{Na}$
  - $^{11}\text{Na}$
  - $^{35}\text{Na}$

- Each diagram below represents the nucleus of a different atom.
 


D




E



Q



R



Which diagrams represent nuclei of the same element?

  - D and E, only
  - D, E, and Q
  - Q and R, only
  - Q, R, and E
- The numbers of protons and neutrons in each of four different atoms are shown in the table below.
 

Atom	Number of Protons	Number of Neutrons
A	8	8
D	9	9
E	9	10
G	10	10

Four Different Atoms in  
Protons and Neutrons in

Which two atoms represent isotopes of the same element?

  - A and D
  - A and G
  - E and D
  - E and G
- An atom that has 13 protons and 15 neutrons is an isotope of the element
  - nickel
  - silicon
  - aluminum
  - phosphorus
- The greatest composition by mass in an atom of  $^{17}\text{O}$  is due to the total mass of its
  - electrons
  - neutrons
  - positrons
  - protons

- The total number of protons, electrons, and neutrons in each of four different atoms are shown in the table below.

Subatomic Particles in Four Different Atoms			
Atom	Total Number of Protons	Total Number of Electrons	Total Number of Neutrons
A	6	6	7
D	6	6	8
X	7	7	8
Z	8	8	9

- Which two atoms are isotopes of the same element?
  - A and D
  - A and Z
  - X and D
  - X and Z
- The table below gives information about the nucleus of each of four atoms.
 

Nuclei of Four Atoms		
Atom	Number of Protons	Number of Neutrons
A	6	6
D	6	7
E	7	7
G	7	8

How many different elements are represented by the nuclei in the table?

  - 1
  - 2
  - 3
  - 4
- Atoms of different isotopes of the same element differ in their total number of
  - electrons
  - neutrons
  - protons
  - valence electrons
- The nucleus of an atom of cobalt-58 contains
  - 27 protons and 31 neutrons
  - 27 protons and 32 neutrons
  - 59 protons and 60 neutrons
  - 60 protons and 60 neutrons
- Isotopes of an element must have different
  - atomic numbers
  - mass numbers
  - numbers of protons
  - numbers of electrons
- Atoms of the same element that have different numbers of neutrons are classified as
  - charged atoms
  - charged nuclei
  - isomers
  - isotopes
- What is the structure of a krypton-85 atom?
  - 49 electrons, 49 protons, and 85 neutrons
  - 49 electrons, 49 protons, and 49 neutrons
  - 36 electrons, 36 protons, and 85 neutrons
  - 36 electrons, 36 protons, and 49 neutrons
- Isotopes are atoms that have the same number of protons but a different
  - number of electrons
  - number of neutrons
  - atomic number
  - nuclear charge
- Atoms of  $^{16}\text{O}$ ,  $^{17}\text{O}$ , and  $^{18}\text{O}$  have the same number of
  - neutrons, but a different number of protons
  - protons, but a different number of neutrons
  - protons, but a different number of electrons
  - electrons, but a different number of protons